

Formulas for  
**PRICING MILK**  
to producers in  
**OHIO**

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# FORMULAS FOR PRICING OF MILK TO PRODUCERS IN OHIO

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## INTRODUCTION

In October of 1947 a producer committee representing the six federal order markets in Ohio, Cincinnati, Cleveland, Columbus, Dayton-Springfield, Toledo, and Tri-State, requested the Department of Agricultural Economics and Rural Sociology of the Ohio Agricultural Experiment Station to explore the feasibility of developing milk pricing formulas that would include certain economic factors not included in formulas then in effect in those six markets.

In the initial meeting of the committee with staff members of the department it was evident that the concern regarding this need for research in pricing by formula was created in a large measure by the unusual behavior of field prices of milk for manufacture in the period covering the last six months of 1946 and the first six months of 1947. (See condensery price in Figure 1). The price per 100 pounds for milk of 3.5% butterfat content paid by 18 midwestern condenseries in November of 1946 was \$4.55 and in June of 1947 it was \$2.98.

Formulas in effect in these markets were based on prices paid for milk for manufacturers and it was generally agreed that they had not resulted in a stable milk price pattern for city supply during this period. These sharp fluctuations in prices derived by this type of formula had caused dissatisfaction, both on the part of buyers and of sellers, and had resulted in some serious dislocation of market supplies.

This producer committee also deplored the practice reached by agreement between handlers and producers of paying premiums over the prices provided in the federal orders. Establishment in the orders of price floors and suspension of certain provisions had also taken place. The hope was expressed that a formula might be devised that would eliminate or at least reduce these difficulties.

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<sup>1</sup>Deceased.

## NEED FOR MORE SATISFACTORY FORMULAS

It was evident in the first meeting of the producers committee with staff members of the Experiment Station that these market leaders were not satisfied with formulas that were built entirely on either the wholesale prices of finished products such as butter, cheese and powder or upon the prices which buyers of milk at manufacturing plants were paying in any particular month to their producers. It was pointed out that in a situation where products could be stored and where at the wholesale level demand might fluctuate widely, the month to month price pattern might well be such as would not be a desirable one for a fluid milk market.

In order to bring other factors to bear upon the price of milk it was recommended that the following economic factors be considered: (1) cost of milk production as represented by feed and labor; (2) the general wholesale price level; (3) the prices of animal products representing alternate uses for feed and labor and (4) demand as represented in retail store sales. The trend of these factors for the 10 years, 1940 through 1950, is shown in Figure 1.

## FORMULA PRICING NOT NEW IN OHIO MARKETS

For several years milk for city consumption in Ohio markets had been purchased by distributors on a classified system based upon its use. The earliest use of a formula consisted of using Chicago 92 score butter as the basis for pricing the various classes.

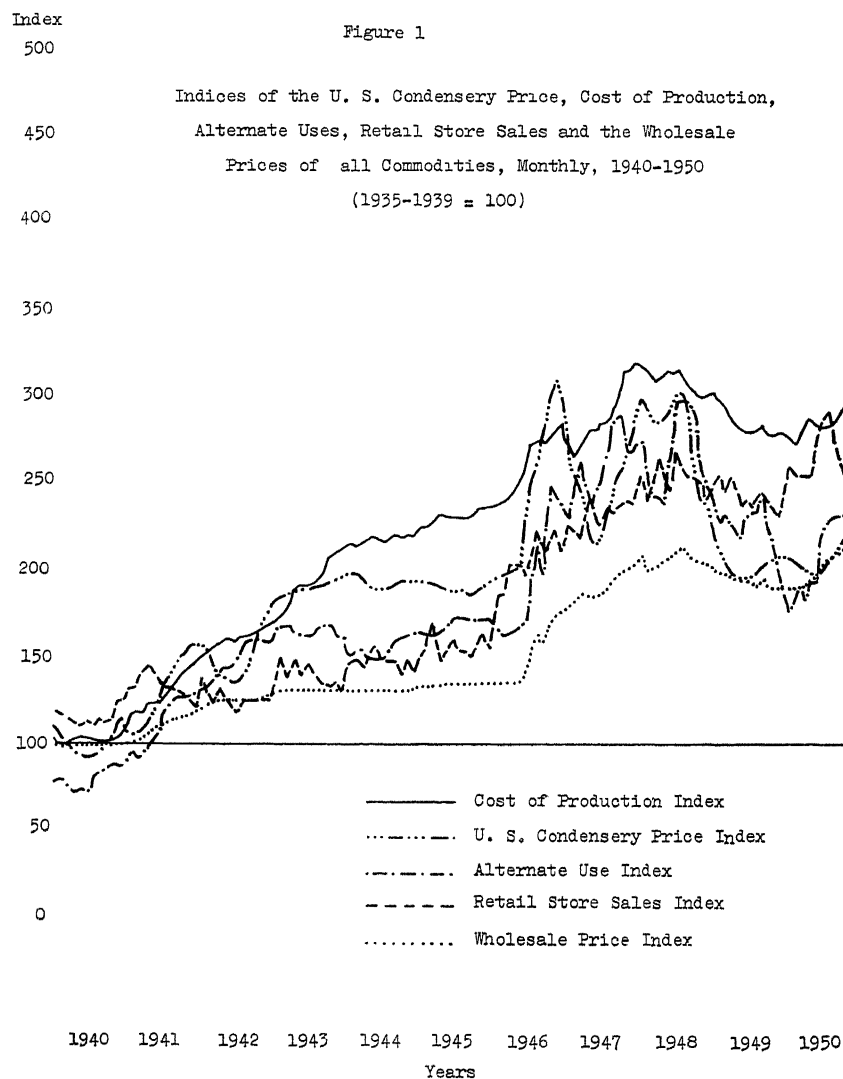
Where federal orders came into the picture, Class III milk was priced on the Chicago butter market. In the initial orders in both Toledo and Cincinnati the actual prices to be paid for Class I and II milk were specified in the order, but the Class III price was based upon 92 score butter in Chicago.<sup>1</sup>

A close relationship between prices prevailing in the city markets and those paid producers for milk going into local evaporating plants has always been recognized in Ohio markets. This relationship was effective in two ways. Its significance at the producer price level was in the fact that the producer blend price in a classified market is competitive with the price paid producers at manufacturing plants. The blend price in the long pull must be enough above the evaporating plant price to induce the producer to maintain his farm and to meet the existing board of health requirements.

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<sup>1</sup>C. G. McBride, State and Federal Milk Marketing Orders in Cincinnati and Toledo, Ohio, O.A.E.S., Bulletin 678, October, 1948.

At the class price level it is generally conceded that the price of milk in Class III, for manufactured products cannot be priced far from the price paid by the general buyers of milk for manufacture. In other words, Class III prices and local condensery prices tend to approach the same level.



When the promulgation hearings for the Dayton-Springfield, Columbus, Tri-State, and Cleveland markets were held in 1946 the economists of the Dairy Branch advocated the introduction of prices paid by 18 midwestern condenseries located in Wisconsin and Michigan as the indicator of the level of manufactured milk prices. The reasons given for this preference were that these prices were less likely to be affected by local influences and therefore were more truly representative as basic pricing of milk for manufacture.

In all the federal order markets in Ohio the butter-powder formula was included as an alternate basic formula price during the latter part of 1946 and early 1947. At about this same time the butter-cheese formula (evaporated code) was also included as an alternate in all markets except in Columbus and Cincinnati, but the use of this formula as a price determinate was rather limited as is evident from Figure 2.

The 18 midwest condensery price or the local condensery price was the predominate price determiner during 1946, 1947, and 1948, however, during most of 1949 the butter-powder price was the higher of the three. Government support of butter prices was largely responsible for keeping this price higher than the other alternates.

There has been a general acceptance by the industry in Ohio of the basic relationship between the condensery price and the price for city milk. In a hearing on amendments to the Cincinnati order held on September 9, 1941, Judge Robert N. Gorman testifying for handlers made this statement: <sup>2</sup>

"What all of us need today, I think, handlers and producers alike, is a blend price for fluid milk that will be in the same percentage of the condensery price as it has been in the past. That is just as essential to the handlers as it is to the producers."

The fact that this statement referred definitely to the past relationship of the two prices supported the position later taken by those working toward an improved formula, that some period of the past should be used as a basis for adjusting current prices.

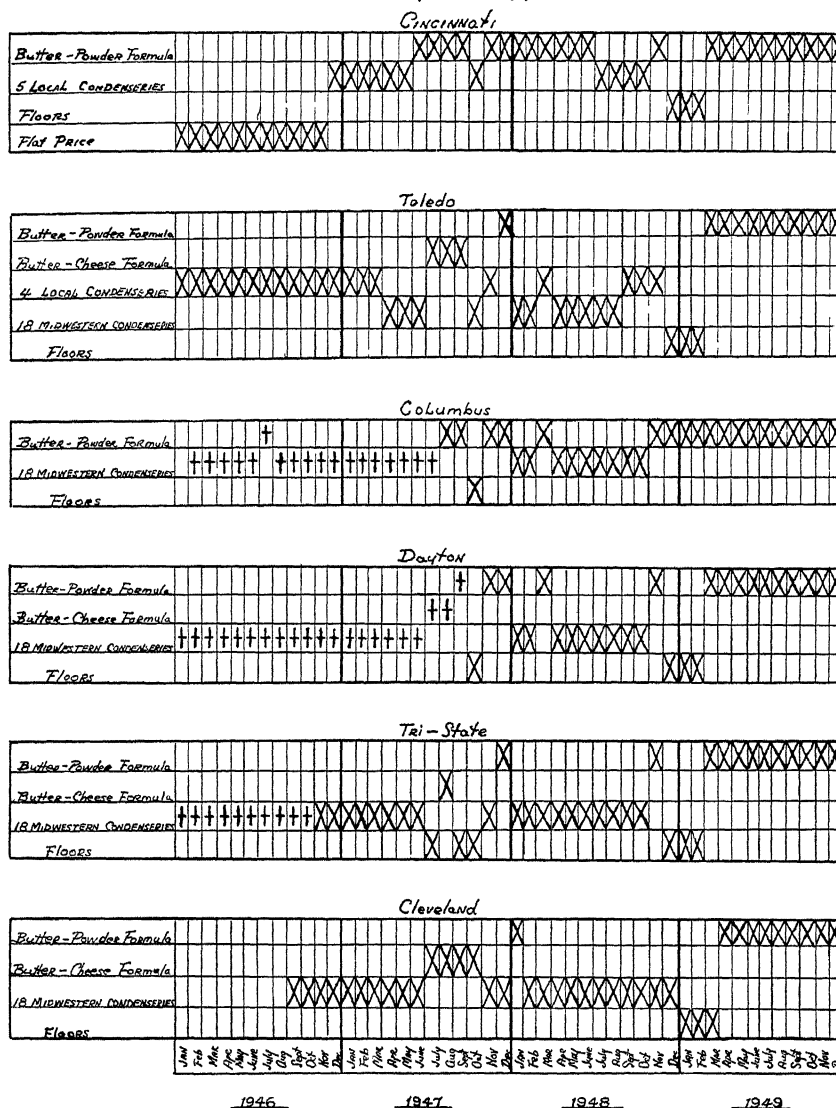
The thinking of the Dairy Branch along the same line was set forth by H. L. Forest in a paper entitled "Should Market Milk Prices be Kept in Line with Prices of Manufactured Dairy Products" presented at the Third Annual Midwestern Milk Marketing Conference at Michigan State College held April 2 and 3, 1948. He said: <sup>3</sup>

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<sup>2</sup>Cincinnati Hearing Record.

<sup>3</sup>Proceedings Third Annual Midwestern Milk Marketing Conference, page 51.

Figure 2  
Basis Used to Determine Prices in Six Ohio Milk Markets  
Under Federal Orders, Monthly, 1946-1949



+ Bracket system modifies prices in these instances.

"After we have arrived at the conclusion that fluid milk prices should be related to manufactured dairy prices, the problem then arises as to how this should be accomplished. I don't think anyone would argue that the prices have to be so directly related that every change in manufactured dairy prices had to be immediately and to the same extent reflected in fluid milk prices. Even operators in the butter enterprise are now greatly concerned with respect to the widely fluctuating butter prices and have indicated that some correction must be made in that respect. To change fluid milk prices with recent butter prices would not be either economical or feasible. Furthermore, these might fluctuate widely from month to month so that it might be necessary to relate the prices only over several months or even a longer period. I say even longer because the seasonal production is probably more serious in fluid milk than in manufactured dairy products and with a given relationship between the two sets of prices to maintain, it might well be that there should be a wider seasonality in fluid milk prices."

#### **BUILDING A FORMULA BASED UPON ECONOMIC FACTORS**

As the research progressed it was recognized that the problem was one of building a formula that would reflect the basic relationship which over a long time must exist between milk for manufacture and that for city use. At the same time it must protect the city milk price structure from undesirable month to month fluctuation. It was decided to work on a plan that would use the manufacturing prices as basic, but would introduce into the formula certain economic factors that would register changes in marketing conditions for fluid milk and that would in turn modify the price based on the existing type of formula.

Economic factors considered important were: (1) cost of milk production as represented by prices of feed and labor; (2) the wholesale price index of all commodities; (3) the price of animal products, the production of which would provide an alternate use for dairy feeds and labor and (4) the level of retail store sales as a measure of demand. Several other factors were considered along with those mentioned above. These included: (1) department store sales index as published by the federal reserve bank; (2) disposable income of consumers; (3) retail sales tax stamp sales and (4) weekly payrolls of industrial workers. The reasoning behind the selection of factors will be discussed later.

#### **Weighting the Factors**

It now became necessary to consider the weights to be given to the various economic factors within the formula. Among the various committees which have been working on formula pricing of milk there seems to be little uniformity of opinion as to the most desirable weighting of



the various economic factors. The Boston, New York, and Philadelphia committees each used different weights for the factors they considered important.

When weighting three or more factors, such as those selected to obtain a composite index, it is found that the forces which affect one factor in many instances also affect the other. This results in a rather high correlation between these economic factors when they are considered over the long run. It was recognized at this point that no single assignment of weights should be considered as perfect or permanent. Experience with the use of these factors may lead to future changes.

The first suggested weighting of these factors was:

Feed and labor costs	45
Wholesale prices	25
Alternate uses of feed and labor	15
Retail store sales	15

At subsequent meetings with economists from adjoining states it was decided to place more emphasis upon the demand factor as represented by retail store sales. As a result the following weights were agreed upon:

Feed and labor costs	40
Wholesale prices	25
Alternate uses of feed and labor	10
Retail store sales	25

These factors weighted in this manner were used to adjust the current condensery price, so as to keep it in line with general economic conditions.

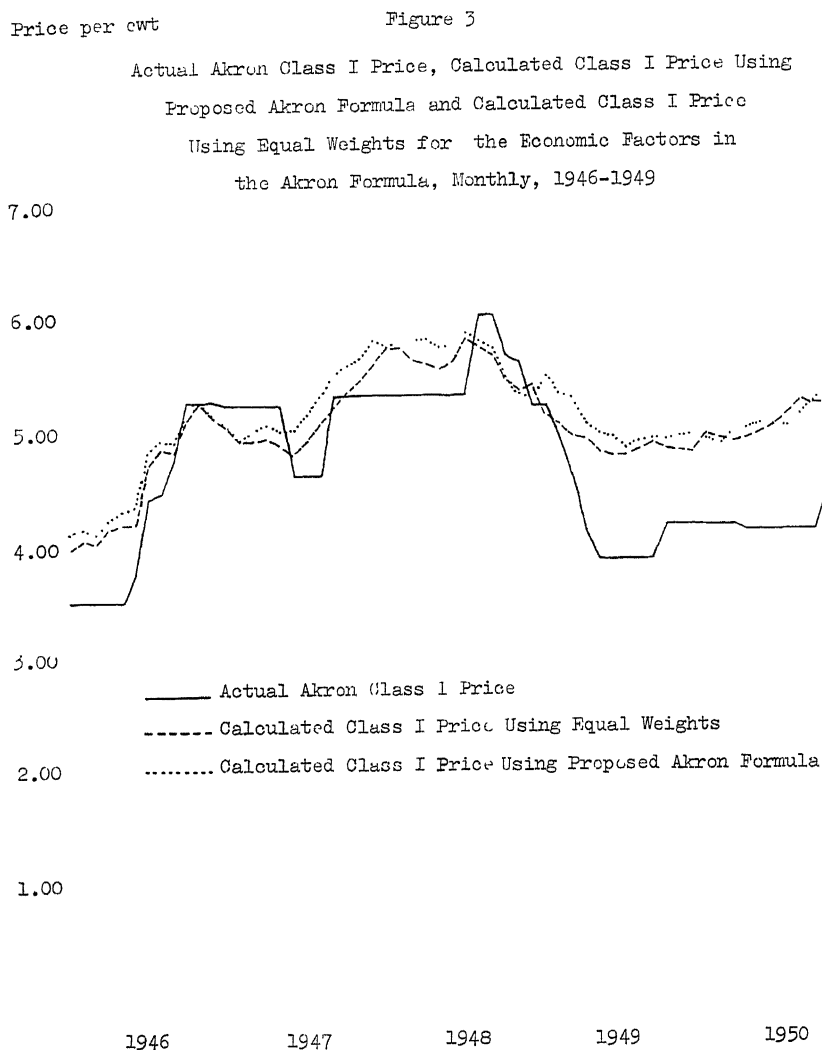
The Akron Milk Producers Association when they later requested research in formula pricing, expressed their desire to devise a formula that would calculate the Class I price directly. It was agreed that the condensery price should still be recognized as having a definite influence upon Class I prices. For this reason condensery prices were included as one of the economic movers within the formula index. To get away from the use of more than four economic movers, the factor of alternate uses of feed and labor was dropped from the formula and increased weight was given to the cost of feed and labor. The weightings proposed for Akron were:

Feed and labor cost	40
Wholesale prices	20
Retail store sales	20
Condensery prices	20

Another computation was made giving equal weight to these four factors and the results of these two computations can be followed in Figure 3.

### Base Period

Several methods could be used to bring the above suggested stabilizing factors to bear upon the price of manufacturing milk. The most desirable plan seemed to be to select a preceding period and



assume that the relationship existing at that period between prices paid at the 18 condenseries and these four suggested factors could be projected on a sound economic basis into the future to arrive at a month to month relationship. The determination of this base period is an important consideration, because when selected it becomes the basing point for all future calculated prices.

A milk price formula, in order to be fair to producers, consumers, and handlers, must be up to date and keep in step with changes in technology. For this reason the base period should be as recent as possible and still be broad enough to give stability to prices. Analyses were made with the various factors on bases of 1925-1929; 1935-1939; 10 year moving average; 5 year moving average of corresponding months; 60 month moving average; 36 month moving average, and a 12 month moving average.

Choice of a base period for use in the Tri-State market was soon narrowed down to (1) 1935-1939, (2) 5 year moving average of corresponding months, and (3) 60 month moving average. The original proposal for the Tri-State market was calculated on a moving average of the corresponding months of the five preceding years, e.g. the base period for January 1950 would be the Januarys of 1949, 1948, 1947, 1946, and 1945. In testimony on the proposal it was stated that some advantage could be seen in shifting to the most recent 60 months. It was believed that this would be a more up-to-date base period and at the same time add stability to the price. In a 60 month moving average a single month has a weight of only one-sixtieth, while in the corresponding months of the five previous years, one month has a weight of one-fifth.

In the Akron proposal a fixed base of 1935-1939 was used to calculate the Class I price directly. The use of this method has limitations with respect to Ohio markets because it is not possible to find accurate prices for Class I milk for a base period as far removed as 1935-1939.

The effect of various base periods upon the calculated price can be noted in Figure 4. It is apparent from this figure that a price based upon the most recent 12 months would follow more closely the movement of condensery prices.

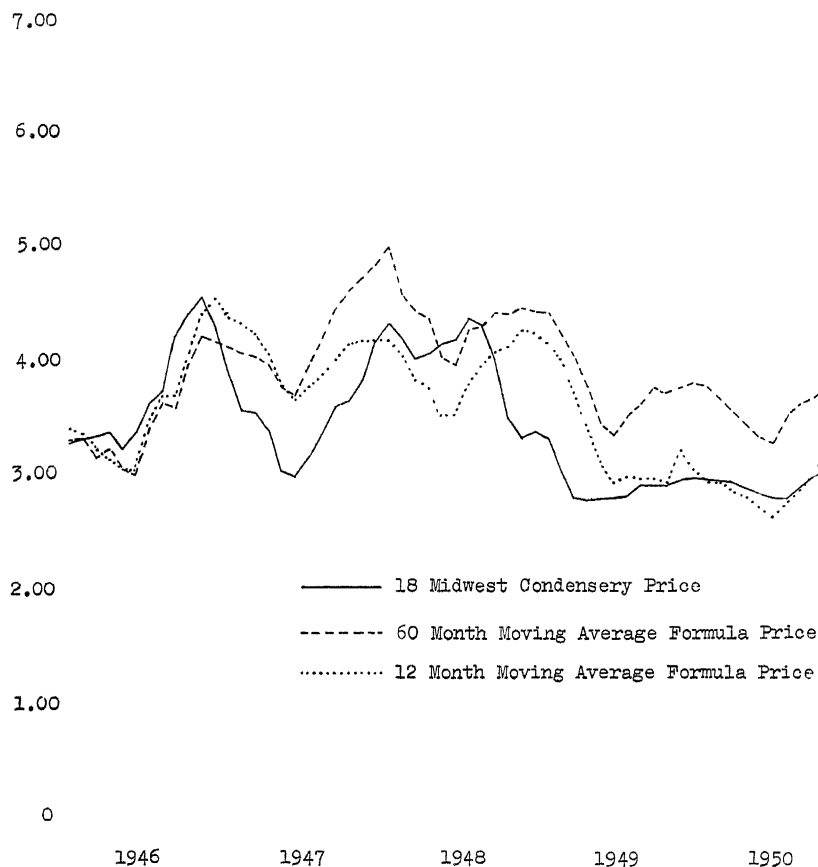
### **Cost of Production**

Because of the many variables involved, the absolute cost of milk production is a difficult factor to measure. There are probably as many opinions on this subject as there are producers within the milkshed. It is not the absolute cost of production which is of significance

in a milk price formula, rather some indicator of **the** relative movement of the principle cost factors of production is necessary.

Costs of milk production can be grouped into two main classes, fixed costs and variable or out of pocket costs. The fixed costs include such items as buildings and equipment, while the variable costs include

Price per cwt  
Figure 4  
18 Midwest Condensery Price, 60 Month Moving Average Formula Price  
and 12 Month Moving Average Formula Price,  
Monthly, 1946-1949



such expenses as feed, labor, electricity, veterinary bills, etc. A dairy farmer may operate his farm a considerable length of time by just meeting his out of pocket expenses even though he is not being properly paid to cover his fixed costs. However, once a farmer cannot meet his variable expenses he will, of necessity, transfer to some other farm enterprise or leave the farm.

For the purpose of a formula to establish Class I milk prices, it seems feasible to construct an index of feed and labor, based upon some past period, as a relative measure of the cost of production. Feed was weighted 60 percent and labor 40 percent which represents an estimate of the relative importance of these two factors of production.

The weight given to this factor in the various formulas have varied from almost zero to 40 percent. In the Akron and Tri-State proposals it was the major factor within the formula with a weighting of 40 percent. The Boston formula gives it a weight of 33 percent, while the Philadelphia formula gives it a weight of 20 percent. In the New York formula it is given no weight within the formula itself, however, it may be considered as a basis for a federal hearing to consider price changes.

Figure 1 shows the movement of the index of feed and labor indicating it is much more sensitive to inflationary forces than is the index of wholesale prices or the index of retail store sales.

### **The Wholesale Price Index**

The wholesale price index of all commodities as reported for the United States by the Bureau of Labor Statistics (1926 base) was used as the source for the wholesale price index. This index is readily available and almost universally recognized as a good indicator of general economic conditions. It may also be used to reflect consumer demand of the country as a whole. The more than 850 commodities making up this index give stability to this factor.

The relationship between this index and Class I prices in Ohio markets has been fairly close over the last 20 years. This relationship was brought out in both the New York and Boston Milkshed Price Committee reports for those particular markets. This index was used mainly to keep the Class I price of milk to farmers in line with general economic conditions so the farmers would not be handicapped when they went out to buy goods.

The weight given to this index has varied considerably in the various formulas. In the Boston formula it was given a weight of 33

percent, while in the New York formula it is the only factor applied to the average 1948 Class I price provided the Class I utilization percentage remains as it was in 1948.

In the proposed Akron formula this factor was given a weighting of 20 percent, while in the proposed Tri-State formula it was given a weight of 25 percent. In the formulas which include other indexes representing the demand side of the market, such as the retail store sales index or index of department store sales, the weight given to wholesale prices tends to be reduced.

#### **Alternate Uses of Feed**

On most of Ohio's farms there is enough diversity within the farm organization so that if one enterprise is more profitable than another, shifts can be made. In order to assure a market of a sufficient supply of milk it is necessary to have a price pattern that does not encourage any large number of dairy farmers to switch to some other type of farm enterprise.

In order to reflect this factor within the formula, seven important income factors were incorporated. The following alternate farm enterprises with their respective weights were chosen: hogs, 44 percent; eggs, 20 percent; beef cattle, 20 percent; chickens, 10 percent; lambs, 3 percent; veal calves, 2 percent; and wool, 1 percent. This combined index was given a weight of 10 within the Tri-State proposal. It was not incorporated within the Akron proposal.

With a weighting of this type, milk prices would not necessarily have to follow some particular species of livestock in which the prices have become erratic. It is only when dairy prices are higher or lower than the weighted average of these prices that the index of alternate uses is significant.

#### **Retail Store Sales Index**

The retail store sales index as reported by the Bureau of Business Research, Ohio State University was used as the source of the retail store sales index. This index is calculated monthly by the Bureau from the reports of 2,500 retail stores who report either to the Department of Commerce in Washington or directly to The Ohio State University. The reports received by the Department of Commerce are immediately turned over to the Bureau of Business Research. This index includes approximately 11 to 12 percent of the total retail sales in Ohio. A preliminary index is available the 10th of the month following the month reported and the final figure, adjusted for seasonality, is available the 5th of the next month e.g. the preliminary report of January sales is available February 10 and the final report adjusted for seasonality on March 5.

Approximately 25 percent of the weighting within the index is given to food commodities and its coverage of other consumer items is more complete than that of the department store sales index. It includes sales of grocery stores, hardware stores, filling stations, lumber yards, eating and drinking establishments and drug stores, as well as the general run of commodities such as are found in department stores.

This index is used as a measure of local demand or the willingness on the part of consumers to spend. Some question has been raised as to the use of this index when the index of wholesale prices is already included within the formula. Its merit is that being an index of Ohio sales only, it has a tendency to localize this demand factor.

The relationship between the index of retail store sales and the wholesale price index can be seen in Figure 1. It is evident that the wholesale price index is much more stable, due probably to the larger number of items included within the index as well as the fact that it is an index of commodity prices whereas the retail store sales index is an index of quantities bought times the prices paid.

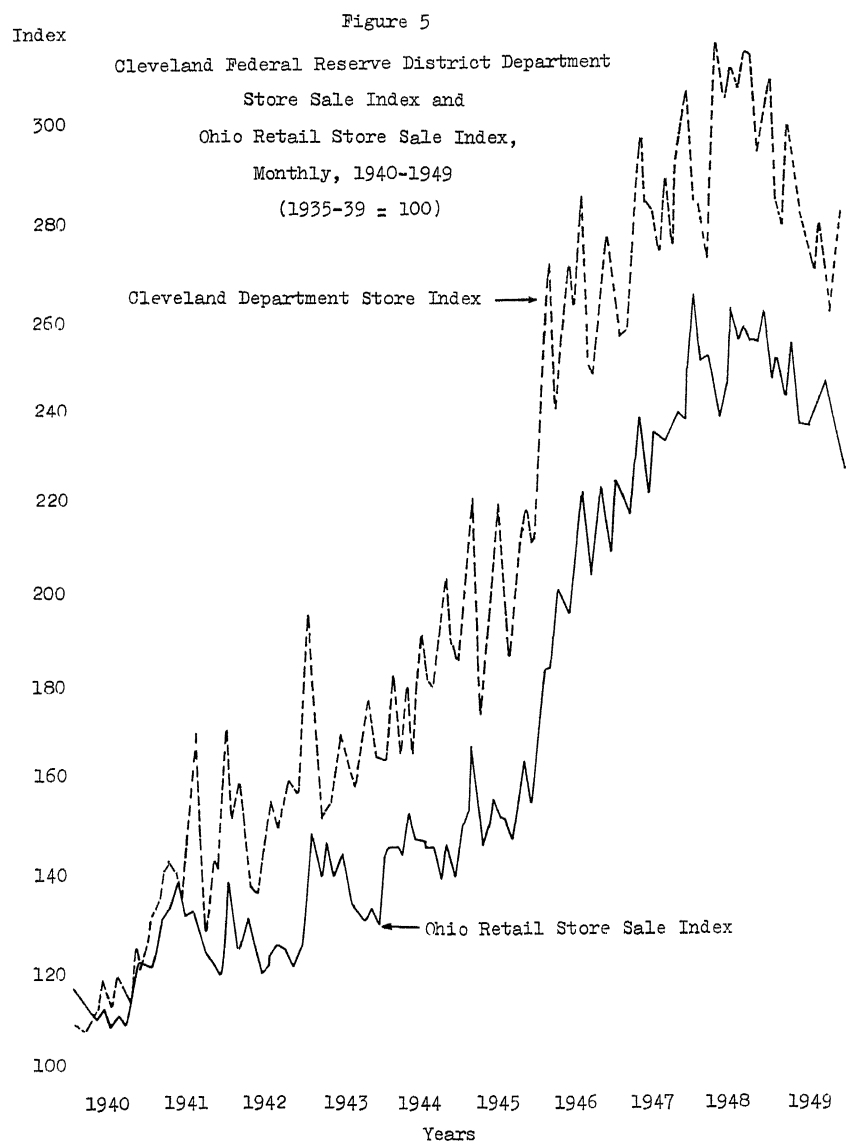
The index of department store sales as calculated by the Federal Reserve Bank is used in the Boston formula as a measure of consumer spending. Figure 5 indicates the relationship between this index and the retail store sales index. The index of department store sales for the Cleveland district, which includes Ohio, are too unstable to be used in determining Class I milk prices in Ohio. Both of these indexes were adjusted for seasonality. Department store sales are also considerably affected by changing credit policies, strikes and other economic disturbances.

### **Condensery Prices**

The real competitors of milk for fluid uses are the condensery and milk drying plants. These plants are scattered over all of Ohio and producers who do not wish to meet the rigid sanitary requirements of the city markets, can usually find a ready buyer at these plants. Hauling rates are usually lower and most of the compliance with rigid city health ordinances is eliminated. To encourage production for city markets, fluid milk producers have been paid a differential above the manufactured milk prices. These differentials have varied from time to time and their movement can be followed in Figure 6.

In August, 1946 the Class I price quotation was actually 10 cents below the basic formula price in the Columbus market. By February, 1949 the differential in the Tri-State markets reached \$1.85 per

hundredweight. Between these two extremes the differentials have been generally unstable. The use of such pricing devices as floors and brackets have been responsible for most of these wide fluctuations. The Columbus order included brackets with a range in the basic formula prices from \$2.00 to \$3.00 per hundredweight. Intervals of \$.25 were





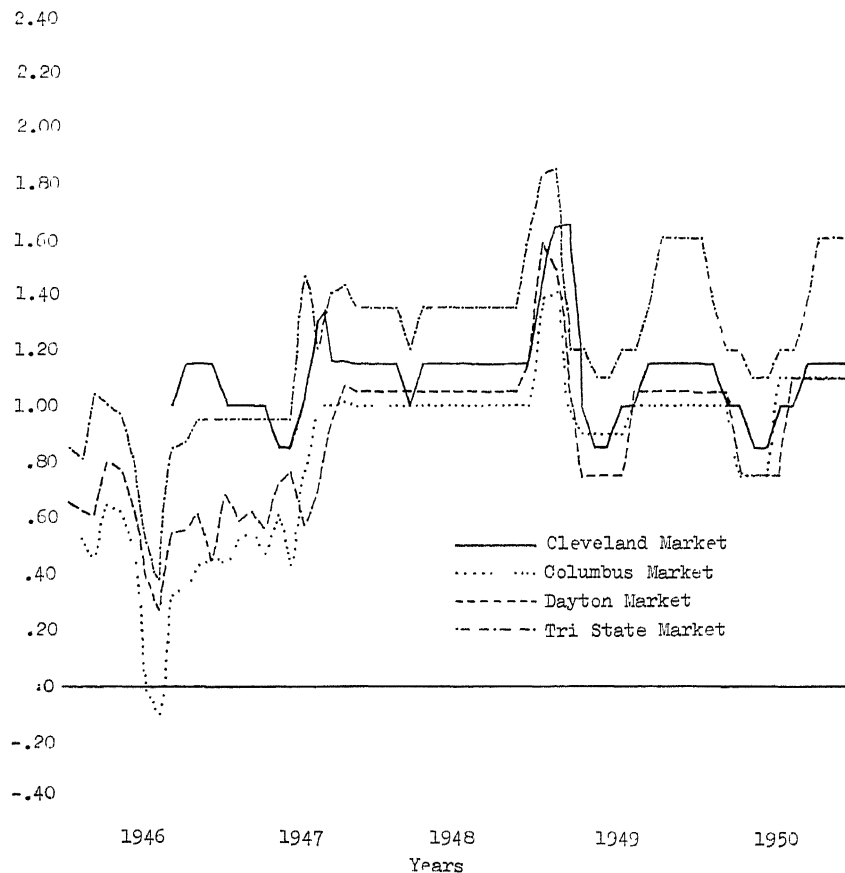
set up within this range. After the end of price control in June, 1946 the 18 midwest condensery prices rose to \$3.62 by August, 1946, 62 cents beyond the limits of the brackets. Bonus payments on the part of handlers were necessary to insure supplies during this period.

During the fall of 1948 the price of manufacturing milk fell rapidly and by January, 1949 floor prices were in effect in most Ohio fluid

Dollars  
per cwt

Figure 6

Differentials Paid for Class I Milk Above Basic Formula  
Price in the Cleveland, Columbus, Dayton and  
Tri State Markets, Monthly, 1946-1950



markets to prevent further declines. This resulted in wide spreads between the Class I price and the manufactured milk prices in all federal order markets in Ohio.

#### **FORMULA PROPOSED FOR TRI-STATE MARKET**

Crystallization of interest to the point of proposing the addition of a formula using the economic factors listed above to an existing federal order developed first in the Tri-State area. Such a proposal was prepared and on March 8, 1948 announcement was issued for a hearing.

The principal objectives of the proposed formula were summarized as follows: <sup>4</sup>

“(a) To bring about and to maintain an adequate supply of milk by keeping the market price for milk in proper relationship to wages paid workers, wholesale prices, and feed prices; to assure both producers and consumers that such a relationship of milk prices to the other specified economic factors will be maintained;

(b) To prevent price upsets and to eliminate the necessity of having public hearings on price changes as often as in the past;

(c) To insure handlers a method of predicting with reasonable accuracy the price they will be required to pay for milk in any given month; and

(d) To eliminate the influence of any ‘manipulation’ of condensery prices in the determination of the price for market milk.”

The amendment as proposed by the Scioto County Cooperative Milk Producers Association; the Athens Milk Sales, Inc.; the Marietta Cooperative Milk Producers Association; and Huntington Inter-State Milk Producers Association which comprise the Tri-State area provided for a formula in which a composite index weighting feed and labor costs 40 percent, wholesale prices of all commodities 25 percent, alternate uses of dairy feeds 10 percent, and retail store sales 25 percent, would have been applied to the average of prices paid producers at condenseries for the corresponding months of the five previous years. At the hearing the proponents expressed willingness to accept as optional a shift of the base period to the most recent 60 months.

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<sup>4</sup>Notice of Recommended Decision and Opportunity to File Written Exceptions Thereto with Respect to a Proposed Amendment to the Tentative Marketing Agreement and to the Order as Amended, Regulating the Handling of Milk in the Tri-state Marketing Area, signed by John I. Thompson, October 28, 1948.

The sources used for computing the indexes of the four economic factors were designated as publications of the Bureau of Agricultural Economics of the United States Department of Agriculture entitled "Agricultural Prices" and "Farm Labor", a publication by the Bureau of Labor Statistics of the United States Department of Labor entitled "Wholesale Prices of all Commodities" and a publication of the College of Commerce and Administration of the Ohio State University entitled "Bulletin of Business Research."

The steps for computing the basic formula price as proposed in the Tri-State market were set down as follows:

- I. (a) Compute a weighted monthly average of dairy feed prices by adding the prices per ton of the previous 60 months with weights as follows: corn, 50 percent; oats, 20 percent; soybean meal, 15 percent; linseed meal, 5 percent; bran, 5 percent, and middlings, 5 percent. Divide this total by 60. Compute a similar weighted average of prices for the same feeds for the current month.

For corn and oats use prices received by Ohio Farmers on the 15th of the month; for soybean meal, bran, linseed meal and middlings the prices paid by Ohio farmers on the 15th of the month. Calculate a price relative of dairy feeds by dividing the weighted average for the current month by the weighted average of the previous 60 months.
- (b) Compute an average of hay prices by adding the prices per ton received by Ohio farmers for all hay for the previous 60 months. Divide this total by 60. Calculate a price relative for hay by dividing the price for the current month by the average of the previous 60 months.
- (c) Compute an average of farm wage rates by adding the rates for the previous 60 months and dividing by 60. Calculate a wage rate relative by dividing the wage rate for the current month by the monthly average of the previous 60 months.
- (d) Combine the dairy feed, hay, and farm wage relatives into an index by multiplying the dairy feeds relative by 40, hay by 27, and wages by 33. Add the three results.
- II. Compile a price relative for each of the following livestock products by dividing the average price for the previous 60 months into the current month's price. Combine these relatives into an index of alternate feed uses by using the following

weights; hogs, 44 percent; eggs, 20 percent; beef cattle, 20 percent; chickens, 10 percent; lambs, 3 percent; veal calves, 2 percent; and wool, 1 percent.

- III. Compute a relative of wholesale prices of all commodities as reported by the United States Bureau of Labor Statistics by averaging the indexes of the previous 60 months and dividing this average into the index of the current month.
- IV. Compute an index of retail stores sales by averaging the indexes of the previous 60 months as quoted by the Bureau of Business Research of the Ohio State University and dividing this average into the index for the current month.
- V. Calculate a composite index by weighting the foregoing four indexes as follows: feed and labor costs, 40 percent; alternate feed uses, 10 percent; wholesale prices of all commodities, 25 percent; and retail store sales, 25 percent.
- VI. Calculate index of price paid producers for milk at the 18 mid-west condenseries by dividing current month's price by the average price paid during the previous 60 months.
- VII. To obtain the correlation factor: divide the composite index of the four economic factors for the current month by the index of price paid producers at the 18 condenseries for the current month.
- VIII. To obtain a price unadjusted for seasonality, multiply the current month's actual price paid producers at the 18 condenseries by the correlation factor of the current month.
- IX. To obtain the basic price for the current month, multiply the unadjusted price by a seasonal factor for the respective month as follows:

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Seasonal* factor	106	105	101	97	92	90	94	97	100	103	107	108

\*Seasonal pattern for periods 1925-1929 and 1935-1939.

In a recommended decision released October 28, 1948, the Dairy Branch took the position that the introduction of the proposed formula at this time was not advisable. This decision was based largely on the results shown by applying the proposal to the period of October 1945 through 1947.

## **FORMULA PROPOSED FOR AKRON MARKET**

In the spring of 1949 Akron Milk Producers Inc. filed a request with the Dairy Branch for a federal order for the Akron market. This association of producers requested the Department of Agricultural Economics to work out the statistics for a formula that would determine the price of Class I milk. This differed from the formula proposed in the Tri-State area in several respects.

The economic factors proposed were cost of production, wholesale prices, retail store sales and the prices paid producers by condenseries. An index was computed from a weighting of these four factors in the proportion of 40 percent for cost of feed and labor and 20 percent each for the other three. The results thus obtained were designated the formula index. The base to which this index would be applied was the average of Class I prices in the Akron market from 1935-1939.

A provision was included in the Akron proposal to keep the Class I price from moving too far away from manufactured milk prices. This provision limited the Class I price range from \$1.00 to \$2.00 above the basic formula price. (Highest of 18 midwest condenseries, butter powder, or butter cheese formula.)

## **COMPARISON OF FORMULAS WITH ACTUAL PRICES FOR VARIOUS MARKETS**

The Akron formula arrived at the Class I price directly while the Tri-State proposal resulted in a basic formula price to which it was necessary to add differentials to obtain the Class I and II prices. The advantages of the first type is that it does away with the need for differentials and is simpler. A formula such as was proposed in the Tri-State area if adopted in all Ohio markets would have the advantage of putting the whole state on the same basic price level and the differences in class prices between markets would be taken care of by differentials. No milk would necessarily be sold at this basic formula price as it would be used only as a basis to price Class I and II milk. Class III milk would still be sold at some competitive price as is being done today. However, violent fluctuations in manufactured milk prices would have less effect on the prices of Class I milk.

With any formula it is possible to calculate the price of milk as far back as basic data are available. In this study, however, only the period 1946 to 1950 is used. In the period from 1942 to 1946 price

controls were in effect which seriously affected the movement of the economic factors used in the formulas. This was especially true of the wholesale price index and the index of retail store sales. (See Figure 1).

In Figure 7 a comparison is made of the basic formula price provided by the federal order in the Tri-State market with prices which would have been obtained by using both a 12 month and a 60 month moving average in a formula including economic factors.

Since the initiation of research on pricing formulas based upon economic factors, several fluid milk markets have adopted this system of pricing. The Boston and New York markets have used this system since 1948. Figures 8A and 8B<sup>1</sup> indicate the Class I and blend prices for 3.5% milk for the Boston, New York and Columbus, Ohio markets from 1946 to 1953.

In few instances since 1946 has the Columbus Class I price been above Boston or New York Class I prices. Since the adoption of a formula based upon economic factors by Boston and New York in 1948, price spreads on Class I varied considerably.

<sup>1</sup> Source: Compilation of reports of the market administrators made by the Program Analysis and Development Division, Dairy Branch, P.M.A., U.S.D.A., and "The Market Administrators Bulletins" New York Metropolitan Milk Marketing Area and Columbus Metropolitan Milk Marketing Area.

Explanation of Prices: Boston prices are for the 191-200 mile zone January, 1945-December 1948, 201-200 mile zone January, 1949-June 1953.

New York class prices are for Class I-A and blend prices for the 201-210 mile zone.

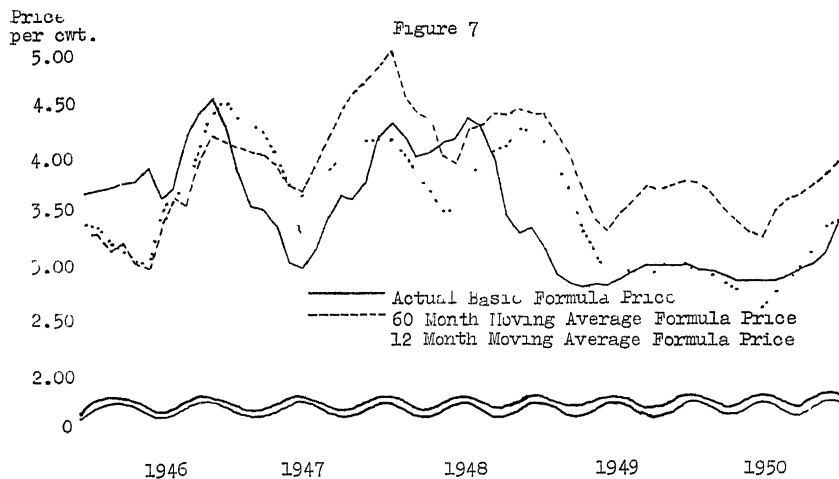


Figure 8A

Price p. cwt.

Class 1 Prices for 1.5 Milk, Boston, Massachusetts (its), New York, and Columbus, Ohio Fluid Milk Markets, Monthly 1946 to 1953

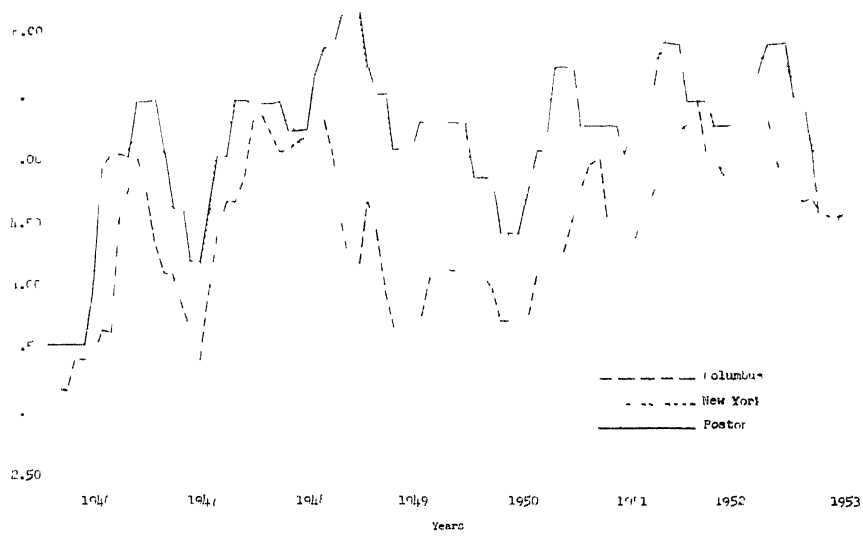
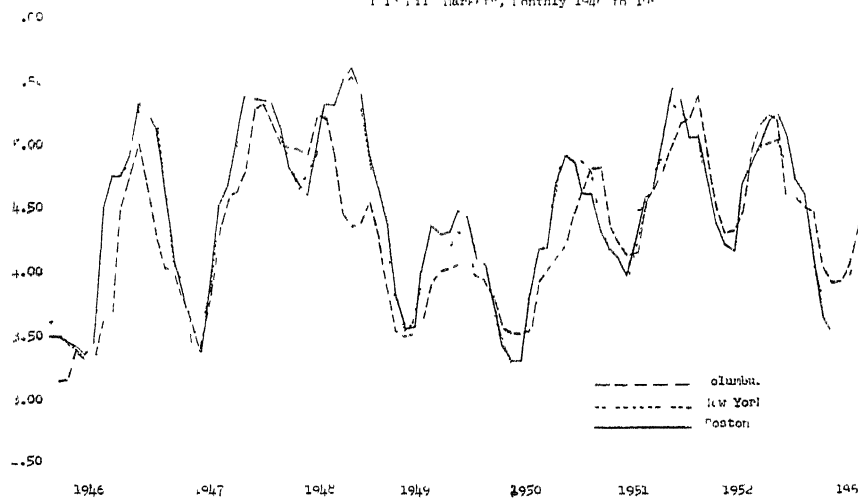


Figure 8B

Price p. cwt.

Class 1 Prices for 1.5 Milk, Boston, Massachusetts (its), New York, and Columbus, Ohio Fluid Milk Markets, Monthly 1946 to 1953



Blend prices however did not follow this pattern. The average blend price for 3.5% milk over this 88 month period was \$4.48 for Boston, \$4.41 for New York, and \$4.28 for Columbus, Class I prices averaged \$5.17 in Boston, \$5.19 in New York, and \$4.47 for Columbus. Although direct comparison of prices between these markets is difficult because of differences in butterfat differentials and other differences, one conclusion can be generally drawn, that high Class I prices do not necessarily mean high producer blend prices especially over the long run.

Several other factors enter into blend prices such as Board of Health regulations and enforcement. For example in the Columbus market only fresh products meeting Grade A requirements can be used in ice cream. As a result ice cream is a Class II product rather than a Class III product as in the case in most other Ohio fluid milk markets. High Class I prices may also result in smaller Class I uses and thus lower producer blend prices.

## SUMMARY

This is a progress report on exploratory research in the feasibility of expanding and refining the methods of pricing milk in Ohio city markets by the use of formulas that include economic factors. The project was initiated upon the request of a producer committee representing six federal order markets in Ohio, Cincinnati, Cleveland, Columbus, Dayton-Springfield, Toledo, and Tri-State markets. The need for this research in pricing by formula was created in a large measure by the unusual behavior of field prices of milk for manufacture in the period covering the last six months of 1946 and the first six months of 1947.

In arriving at a meeting of minds as to what should be the component factors of an improved formula, marketing economists from Michigan, Indiana, West Virginia, Kentucky, and Ohio, as well as milk producers, distributors, market administrators from all federal order markets in Ohio, and economists from the Dairy Branch, P.M.A., Washington, D. C. were called together. Throughout these conferences the marketing economists of the agricultural colleges took the position that they were not proponents of a specific formula, but were conducting exploratory research so far as time and facilities would permit.

Pricing milk for city consumption, using formulas now in effect, results in market disturbances during periods of rapidly changing price level. So long as the price level remains fairly stable, manufactured



milk prices have been a reliable basis for pricing Class I milk. However, with a rapidly changing level of prices, such as we have experienced since World War II, manufactured milk prices often behave in a peculiar fashion creating serious problems in the fluid milk markets.

Exploration in the field of economic factors revealed that the following points needed consideration: (a) the availability of various price series, (b) the correlation of the various factors with each other as well as with fluid milk prices, (c) time of release of the various data. Factors selected as being important were cost of production, wholesale price, retail store sales, alternate uses of feed and labor and the price of milk at condenseries. The inclusion of additional factors appeared to add little to the stability of the formula index.

It was found that no single assignment of weights to these factors should be considered as perfect or permanent. Shifting of weights among these factors to the extent that it was done in this study, resulted in only slight change in the calculated price.

In the selection of a base period it was necessary to consider the availability of data and the representativeness of the period. Fixed base periods prior to 1940 were found to be seriously affected by the lack of reliable data in many markets.

The Tri-State market was the first Ohio market to incorporate a formula based upon economic factors for proposed changes in their federal order. The economic factors used in this formula were cost of production, alternate uses of feed and labor, wholesale price index, and the retail store sales index. After several weeks of deliberation the Dairy Branch came out with a decision failing to approve the formula.

In the spring of 1949 the Akron Milk Producers filed a request for a federal order for that market. They requested the Department of Agricultural Economics work on a formula that would determine Class I prices. Economic factors used in this formula were cost of production, condensery prices, wholesale price index, and the retail store sales index.

Comparison of actual prices with prices calculated according to a formula based upon economic factors reveals that generally this calculated price would have been higher than actual prices paid. At times it would deviate considerably from prices resulting from formulas now in use. This would necessitate the adoption of a formula of this type for the state as a whole in order to be most effective. The formula may work in the Tri-State area alone because its supply area is isolated from the other major Ohio markets. In the other federal order markets

of the state there is a considerable amount of overlapping of supply areas. If one market chose this method of pricing while a neighboring market continued its present formulas, supply dislocations might result.

A formula for pricing milk, based upon economic factors will not necessarily result in the "perfect" price for milk. Formulas such as those proposed for the Tri-State and Akron markets, are made up of four economic factors, with specific weights for each factor, and it is obvious that other factors also enter into the determination of price or that a different schedule of weights might be more desirable.

It was the hope of proponents of formulas based upon economic factors that this method would reduce the number of federal hearings called for the purpose of price changes. Comparing prices calculated according to these proposed formulas with prices actually received by existing formulas indicates that fewer hearings would have been necessary during 1947 and 1948. Much would depend upon the confidence placed in this type of a formula by producer and distributor leaders to adequately reflect changing economic conditions.

It should be remembered that producers react to blend prices rather than to Class I prices. These formulas would be used to price Class I milk and therefore would have an indirect effect on the blend prices. Certain supply-demand safety mechanisms based upon utilization may be desirable to avoid the calculated price getting too far out of line with the supply of or demand for milk.